APPENDIX N

Method and System for Additional Improvement in the Switching Fabric Supervision and Control of a Wire-free Electric Power System

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Background

What is further needed are additional improvements to improve usability and/or cost and/or behavior of a system. For example, by guaranteeing a certain order in the voltages, the number used of certain components may be reduced. Also, by offering, for example, a contact-breaking voltage pulse, cleaning requirements for the surface may be reduced and usability improved. On the client side, a capacitor may be used to store energy during the single-wire "communication." with a quick-charge circuit to allow a quicker charge of the wire without overloading it.

Description of the Embodiment

Figure 1 shows one example embodiment of the novel art of this disclosure featuring a half bridge with a diode for the back flow. Programmable power supply 100 is controlled by controller 120 and has two outputs V1 and V2. A typical switch cell 110 has two high-side transistors 111 and 111b and has a flow-back diode 112 to avoid flow-back in case V1 is higher than V2 and a parasitic diode of MOSFET switch 111b would conduct in a backward mode. Also shown are low-side switch 111c, high-side switch for higher voltage 111a, and cell controller 113, which is also controlled by controller 120. In this embodiment, controller 120 can always ensure that the voltage V1 is greater than voltage V2, and therefore only one diode is needed in this embodiment.

In some cases of a two rail cell, instead using of a diode, a bipolar MOSFET switch can be used, at least on the lower voltage rail (no need on the higher rail). In the mosfet cell configurations, all the high side switches are P channel and the low side switches are N channel. With a proper biasing and level shifting, N channel can be used in the high side and P channel in the low side. Reduced RDSon of the two bipolar P channel and a deeper saturation when operating with a rail voltage of 3 volt is achieved by connecting to MOSFETs in series with their sources connected.

Figure 2 shows another example embodiment of the novel art of this disclosure. The system disclosed in **Figure 1** is slightly modified to include an additional voltage. In addition to delivering voltages V1 and V2, power

supply 100 delivers a voltage VBR that is used to break through dirt and oxidation on contacts. In this example embodiment, an additional high-side switch 211a has been added and two diodes 112 and 212 are now required. When a device is connected, the VBR is turned on for a short pulse before the power turns on, thus providing cleaning of the contacts and a quick charge of the capacitor on the device side. In some cases, these benefits may be achieved by also using one of the rails that normally can provide the higher voltage, but that voltage can reach a sufficient high value.

Figure 3 shows a typical arrangement for a novel client device. The power in is led via diode 305 and protection resistor 306 to charge capacitor 304, which supplies the control circuit. A voltage or current detector 303 may be included for protection, and the controller can activate safety switch 301. In the example of the break voltage disclosed in the description of **Figure 2**, above, switch 301 would not be released until the voltage has stabilized in a safe region, correct polarity, etc. Not shown is a polarity reversal protection diode, which may be applied across power and ground on the input side. Load 310 would typically be a device such as a notebook computer, PDA, cell phone, or other, similar device that is placed on a wire-free surface.

Figure 4 shows a further improvement to the circuitry. Voltage detector 303 has the ability to turn on a bypass switch 403, thus permitting a very quick charge of the energy store capacitor 304, which is needed because interruptions in the supply can occur, during moving, signaling, etc.

In some cases, the fast charging described above can also be done from the base by providing a short pulse of higher voltage or lower impedance (the bases have a pull up resistor with a typical value of about 300ohm, from which the adapter is powered) when scanning, just before starting the communication. The switching charges the capacitor faster through the series resistor and allows starting the communication after a shorter delay.

Figure 5 shows an alternative embodiment to the novel art disclosed in **Figure 1** and **Figure2,** with a current sense rail on the ground side that can be shared, and the Rx/Tx circuitry on the bottom used for transmitting data during the sense mode.

Figure 6 shows how large surfaces can be made by daisy-chaining multiple subsystems into one large system with one combined power rail.

Figure 7 shows yet another approach, in which a small surface is embedded into a larger surface that doesn't necessarily have its own power supply.

Figure 8 shows eight additional different configurations for the cells.

In yet other cases, the base has a controller that is powered from the same power supply as the external device (typically, a single voltage input to the base is used). If the device has a short circuit, the input voltage of the base goes to zero, which normally then powers off the controller. This resulting power off can be very bad, as it causes the controller to loses all the state information. One method of avoiding such a result is to make sure to disconnect the load immediately, and to have a similar capacitor to maintain power for the controller during the shutdown.

In some cases, the total power needed by all devices may exceed the power available. The controller in the base may make a determination after communicating with all devices of how to allocate power, based on the needs and capabilities. This determination may include such factors as charge requirements, whether the device has a battery or not, if it is in standby or active mode, etc.

In yet other cases, the cells used in the base may include various types of ESD/EMP protection, including, but not limited to, capacitors, inductors, resistors, diodes, Schottky or other fast diodes, or other suitable components to protect the circuitry as is appropriate and well known in the art.

As shown in **Figure1**, the modular cells 110, which have a small controller 113, may include just basic decoder/addressing, or in some cases 'intelligence' such that they are programmed from a central controller for a certain device or power delivery scheme and from then on, they monitor the device current/ voltage, etc., and perform automatic control or shutdown of the device as needed.

In yet other cases, those modular cells 110 may also include facilities for data link with the device (not shown).

In some cases, the modular cells 110 may communicate with a central controller (i.e., controller 120) or may even communicate among themselves (not shown) to coordinate the operation, power allocation, device connectivity (e.g., whether the (+) of the device can be in one module while the (-) is at another), etc.

Further, in some cases the cells 110 may include a facility (not shown) for automatic configuration of the system base on the connectivity, size, configuration and capabilities of the modules. For example, the cell could report their capabilities to a central controller.

Additionally, the intelligence and function of the centralized system could be distributed in many ways among the smart cells for better modularity. Attached with the present application are Appendices A through M, which are incorporated herein by reference.

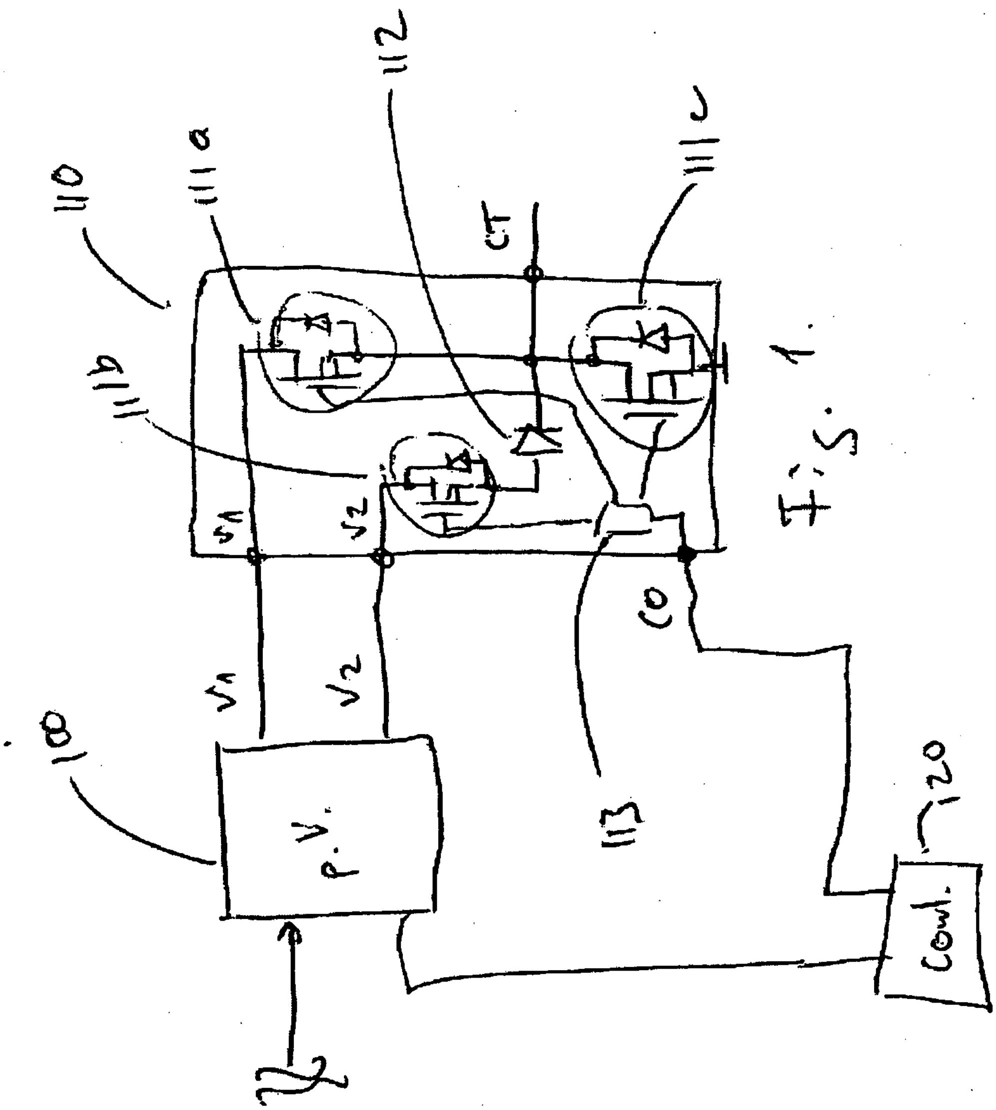


Fig. 1.

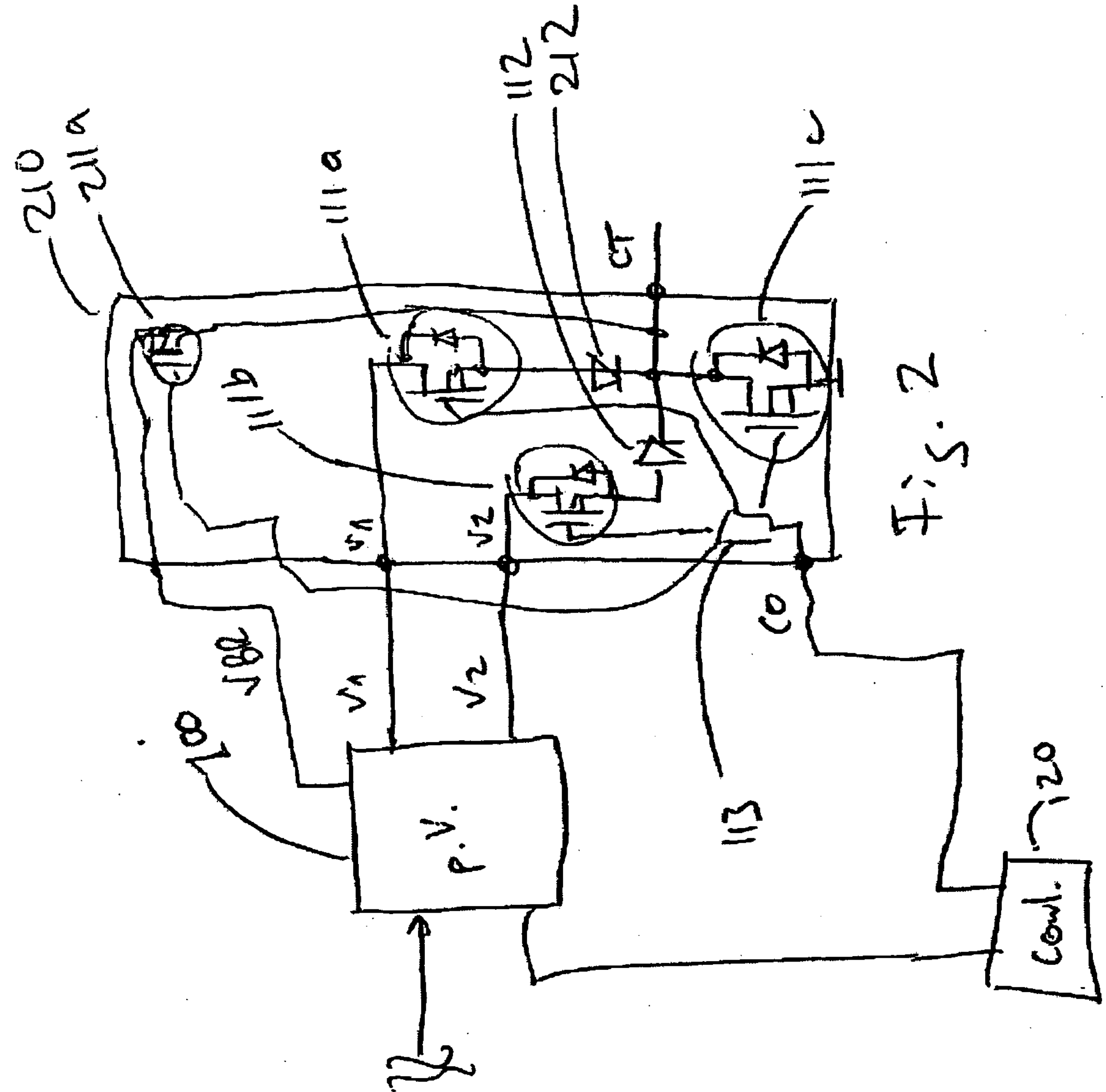

210
211a
111a
112
212
CT
111c
111b
V1
V2
108
100
P.V.
113
CO
120
Cont.

Fig. 2

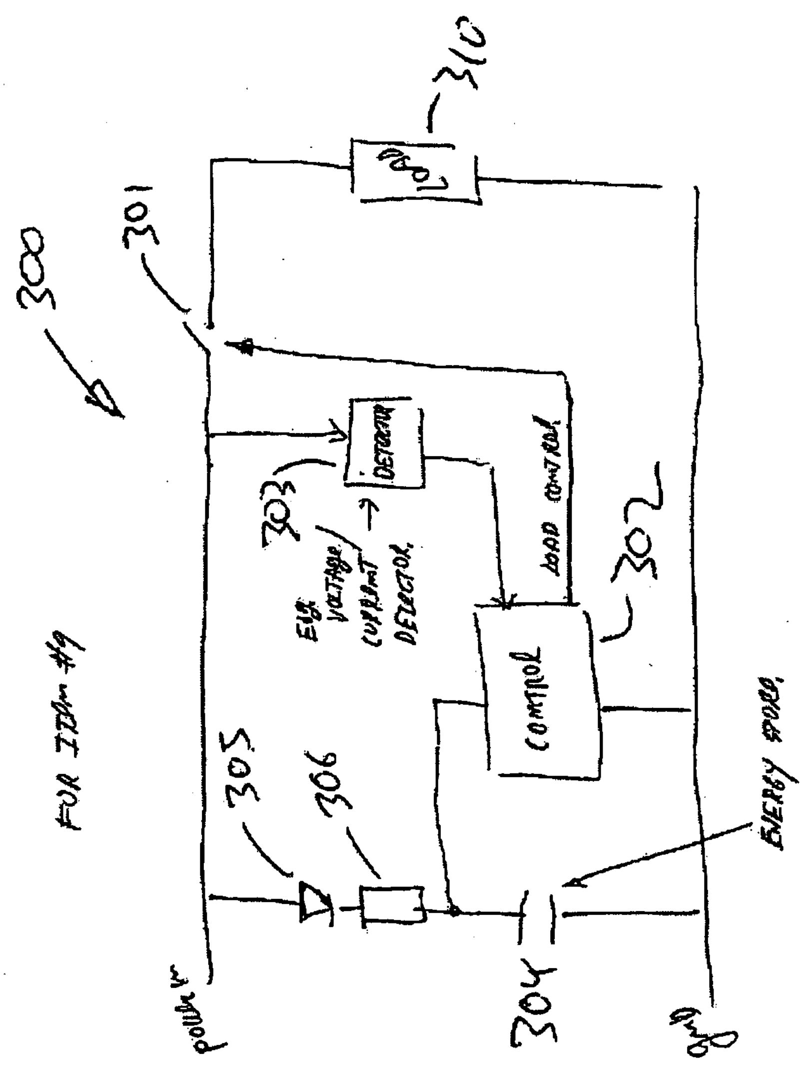

300
301
310
LOAD
DETECTOR
303
E.G. VOLTAGE/CURRENT DETECTOR
LOAD CONTROL
302
CONTROL
FOR ITEM #9
305
306
304
ENERGY STORE
power
gnd

Fig. 3

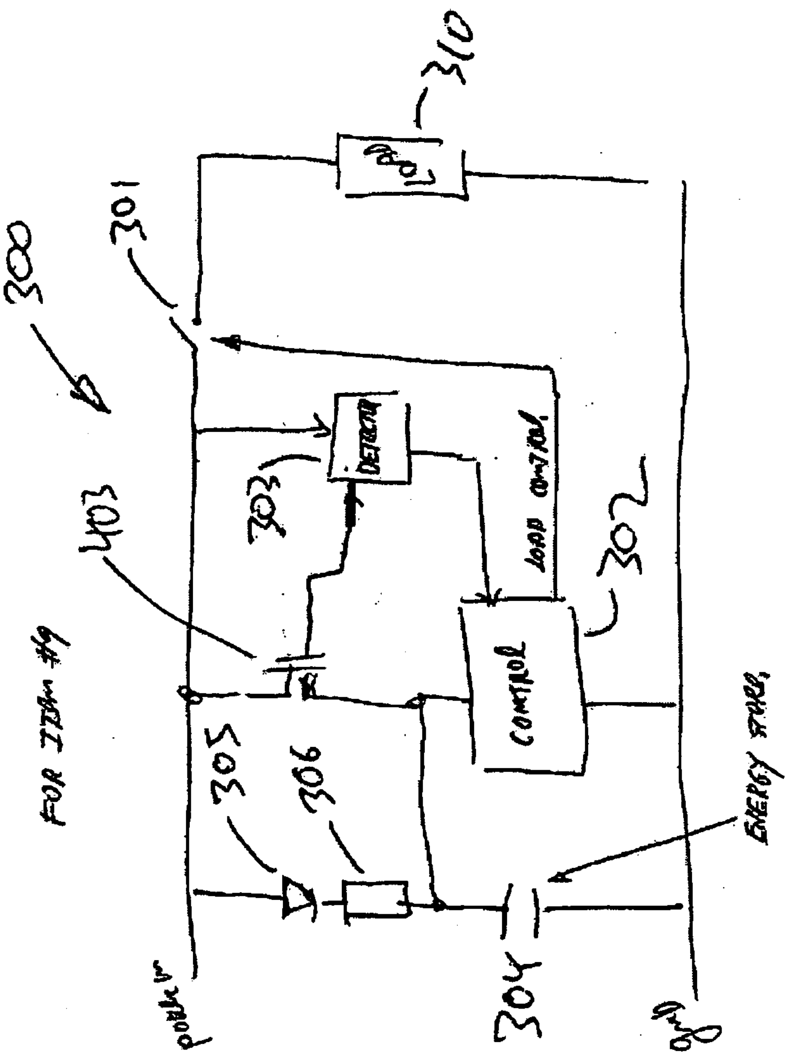

300
301
310
LOAD
DETECTOR
303
403
LOAD CONTROL
302
CONTROL
FOR ITEM #9
305
306
ENERGY STARS
304
POWER IN
gnd

Fig. 4

FOR ITEM #5

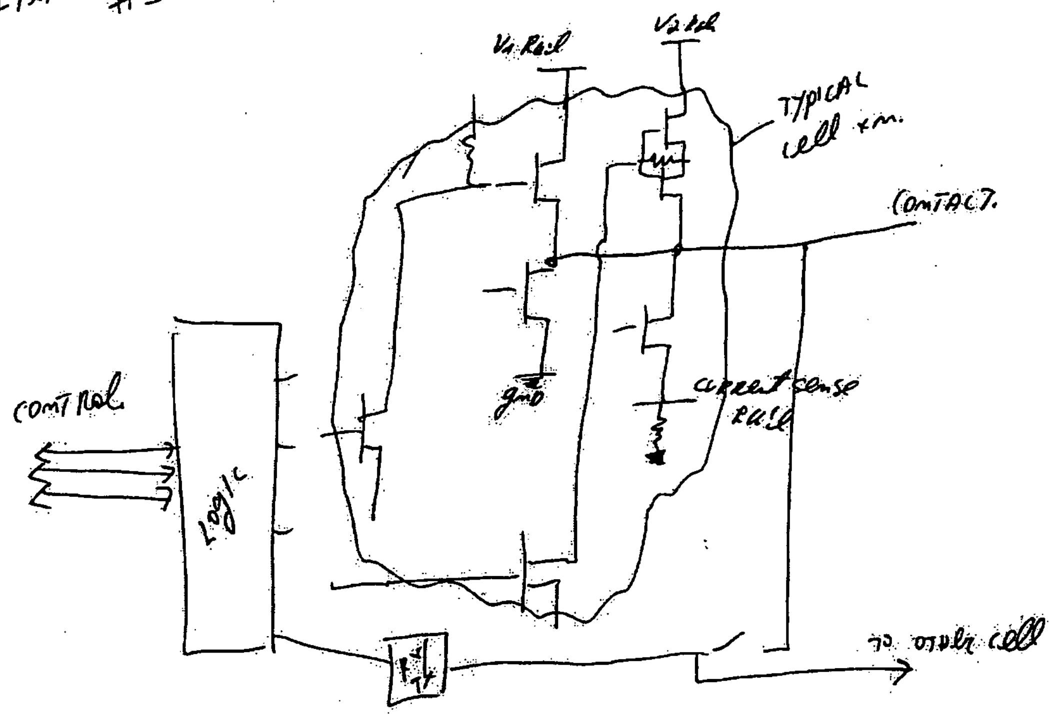
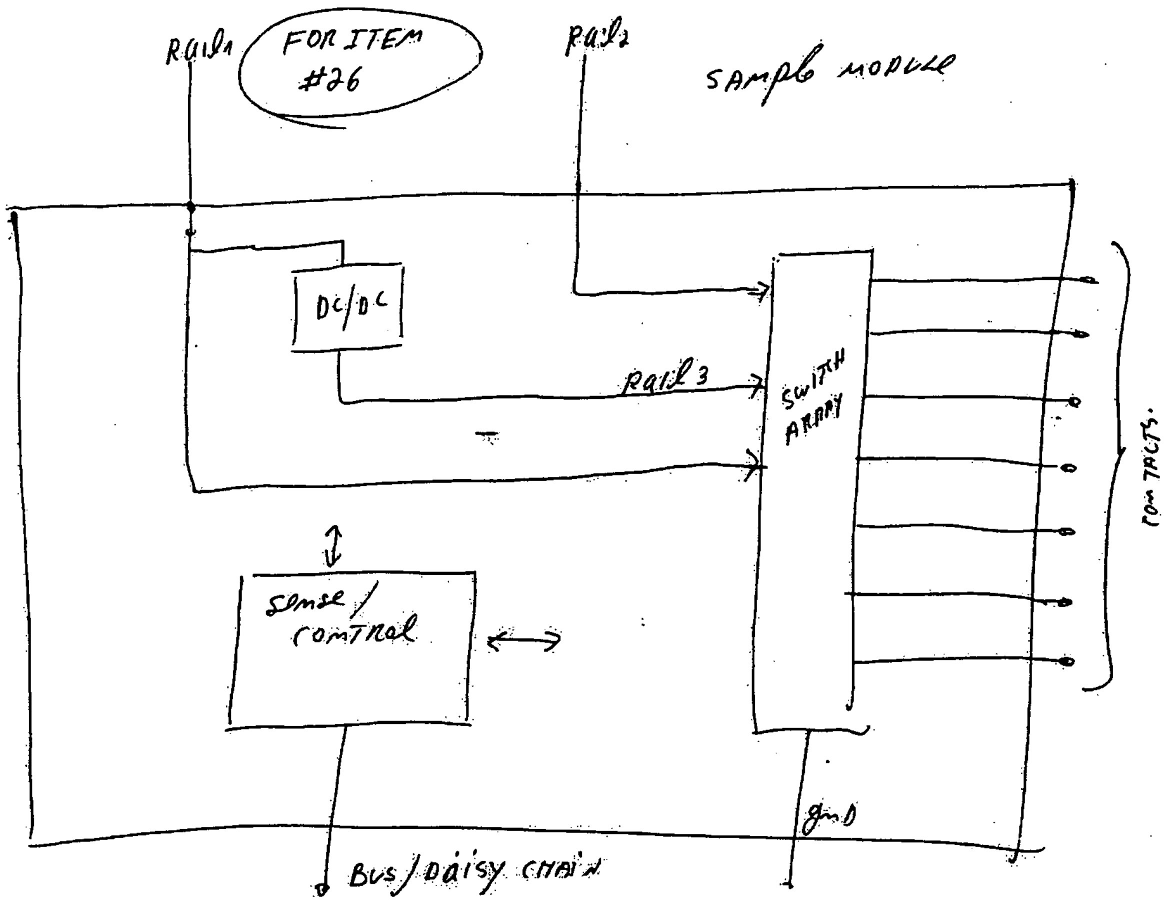


Fig. 5



Rail 1
FOR ITEM #26
Rail 2
SAMPLE MODULE
DC/DC
Rail 3
SWITCH ARRAY
CONTACTS
sense / control
gnD
Bus/Daisy chain

Fig. 6

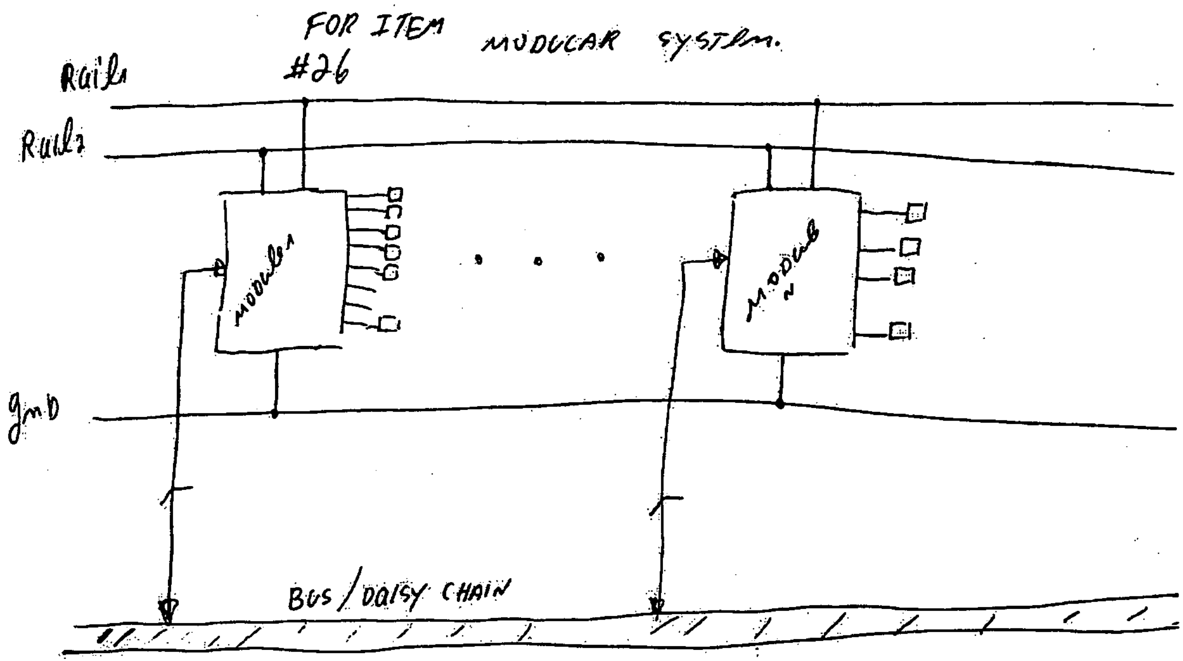

FOR ITEM #26
MODULAR SYSTEM.
Rail1
Rail2
MODULE 1
MODULE N
gnD
BUS / DAISY CHAIN

Fig. 7

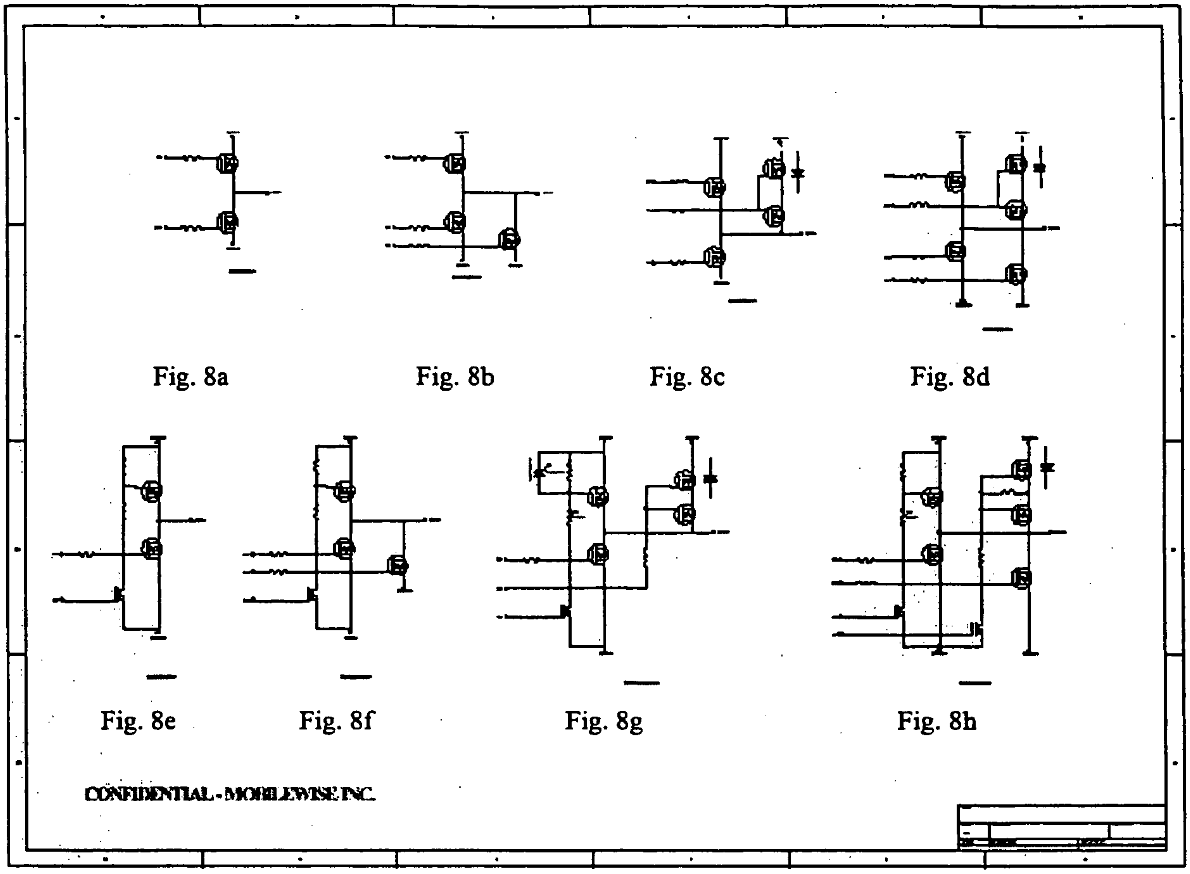


Fig. 8a
Fig. 8b
Fig. 8c
Fig. 8d
Fig. 8e
Fig. 8f
Fig. 8g
Fig. 8h
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Fig. 8